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**PATTERN OF DEFECT ASSOCIATED
WITH STEM STUBS ON NORTHERN HARDWOODS**

Decay and discoloration are the principal defects that reduce quality of northern hardwoods in New England. We need to know how to minimize these defects in young growing stock, and how to recognize them in merchantable trees. To determine accurately the amount of internal defect in trees, we must know the quantitative relationships between external signs on stems and the losses within them. The purpose of this note is to point out the defect pattern associated with dead stubs of main stems that persist on living northern hardwoods.

The leading shoots of young trees may be killed by disease, insects, suppression, and mechanical injuries. New leaders often form from lateral branches or from adventitious buds on the live stem below the killed portion. The dead stem section deteriorates until a stub is all that remains.

In early stages, stem stubs can be differentiated easily from branch stubs by their acute angle from the main stem and by their occurrence near abrupt bends in stems (fig. 1). As stem stubs decay and drop off and as the trees straighten, it becomes increasingly difficult to identify the stubs as remains of old main stems.

During studies of decay and discoloration in northern hardwoods in the White Mountains of New Hampshire, more than 1,000 trees were dissected longitudinally and examined, and the relation of internal defects to external indicators was established. It was easy to differentiate old



Figure 1.—Stem stubs on (left to right) yellow birch, red maple, and sugar maple. On the sugar maple a crack formed below the stub as callus enveloped it.



Figure 2.—Dissection of the stems shown in figure 1. Most of the defect associated with stem stubs advanced downward into tissues that were present when the main stems died.

stem stubs from branch stubs in the dissected sections. The pith below the stem stub was in a straight line with the stub and differed from the curved path of the pith in branch stubs and in the new main stem formed above the stem stub (fig. 2). In a few trees studied, the stem stub was decayed completely, leaving behind a hole in the stem (fig. 3).

Stem stubs were most common between 6 and 16 feet above the ground, and stub diameters were usually less than 5 inches. Cracks sometimes formed above and below the stubs (fig. 2). Defect associated with stem stubs advanced downward faster in yellow birch and slower in sugar maple than in other species (fig. 2).

Decays and discolorations that advanced from stem stubs into living tissues in the stem were limited usually to those tissues present when the leaders died. Because of this, most of the defect advanced downward. When a large lateral branch below the killed terminal became the new main stem, defect advanced also into those tissues present when the terminal died. If decay and discoloration later developed in the new main stems and spread downward, it sometimes joined defects arising from stem stubs. This was more common with discoloration than with decay (fig. 4).

Figure 3.—A hole in a yellow birch that formed when the stem stub decayed away.



Figure 4.—Dissection of the tree shown in figure 3. Discoloration advancing downward joined the discoloration around a hollow column. This column indicated the location of the old main stem. Decay did not advance into the new main stem.





Figure 5.—Dissection of a paper birch, showing the black sterile growth of *Poria obliqua* on a stem stub. This fungus infects new main stems.

A common exception to the above defect pattern was caused by *Poria obliqua* infecting stems through stem stubs. This fungus readily invaded tissues formed after the leader died, including the new main stem (fig. 5).

These observations indicate that defects associated with stem stubs usually advance downward and that the diameters of defect columns in trees are approximately the diameters of the stem stubs.

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